

**DSN Mission Schedule Process Retreat**  
**10 December, 2009**  
**8:30 am – 4:30 pm**

**Agenda:**

- Goals and Status DSN Schedule Process
- Schedule Requests, User Loading Profiles
- Schedule Request: Flexibilities and Constraints
- Schedule Priorities
- Schedule Locking
- SPS Service Scheduling Software (SSS) Delivery Plans/Schedule
- Schedule 7-Day File Output Format Review
- Open Discussion
- Deep Space Operations Center (DSOC) Tour

**Minutes:**

**Topic 1: Criteria for Tracking Requests**

Interactive discussion began by presenting set of questions on slide 8: “**Criteria for Tracking Requests**”, to get feedback from all missions on their inputs and requests to the schedule process:

- What is the mission driver for your tracking requests?
- Are you adhering to your original predictions when the service agreement was signed? Should we track that?
- How do you define full vs minimum mission success criteria and how (if at all) are your tracking requests related to those criteria?
- Is there a common language across missions?
- How are your tracking requirements related to your project’s risk policy (for eg., do requirements include margin to accommodate lost data)?

Mission representatives discussed drivers for tracking requests. There was consensus that:

- Missions provide maximum and sometimes minimum requirements to meet full mission success.
- Missions provide minimum requirements for survival, based on health and safety.
- Missions are not ‘padding’ their requests, only asking for tracks required to ensure full mission success
- Schedule requests that are denied means lost science to the mission
- Schedule requirements are usually based on getting as close to 100% of the data as possible
- If there’s an important event, the max requirements are requested. At times the requests are very complicated depending on events

Individual Mission Responses captured:

D. Gates, GOES – GOES missions only uses DSN for critical LEOP (24x7 for first 9 days). Therefore, request is made for full mission success.

A. Bowman, NHPC – NHPC gives both survival for spacecraft health/safety and max requirements for full mission success.

R. Burns, SSMO Deputy Mgr – GSFC SSMO missions schedule for 100% data return of full mission success

L. Rhoads, SSMO Scheduler – When GSFC projects must reduce tracking requests due to contention, it is worked out with the project

M. Kelley, Kepler – Kepler mission receives data once a month. Per the Kepler DSA, the mission schedules backup Ka-band science tracks in case first attempt isn't successful. This is how the ULP is submitted, but they do release backup Ka tracks if it is not needed.

D. Bindschadler, MGSS – Duane questions why we are attempting to obtain this info from all the mission reps present at the retreat. In the course of negotiation, the missions will all figure it out and so discussion outside the negotiation process is not needed.

B. Arroyo, MRSS Scheduler – Problem starts at proposal phase. Also, 'requirements creep' during follow-on phases adds to the problem. DSN Service Agreements are not inclusive enough, adequate analysis is not available at the time of proposal. The DSN network is under-utilized due to various constraints such as hours/shifts/unattended type limitations. For Mars missions, they submit ULPs based on their own mission's success along with any relationship to other mission's success (eg., relay services).

B. Waggoner, Dawn – in agreement with Belinda. The use of full/minimum requirements not necessarily the correct approach. Need to review all aspects.

D. Balke, Chandra – Chandra's ULP submissions are asking for minimum requirements, not padding their schedule requests

R. Best, DSN Sched – Maintenance requests are representative of the minimum requirements

D. Seal, Cassini – In order to move forward, missions should plan to use time requested (no pad). Always willing to negotiate time but other missions need to know reason and impact of request.

M. Johnston, S3 CDE – S3 developer adds that the system (S3) needs a little more insight into meeting mission success to use this criteria in optimizing schedules

R. Burns, SSMO – Schedule process needs to include prioritization of requests

K. Yetter, MRSS Scheduler – Karen would rather work on contention in RAR than at midrange phase. S3 may be able to provide better tools for analysis.

D. Bindschadler, MGSS – Mission operational margins are owned by the projects. They are used at the time of conflict resolution.

D. Ossing, Stereo – DSN mission schedule process works today due to dedicated folks.

N. Angold, ULYS ESA – Nigel is not convinced that the scheduling process is broken,

but It does need updated tools, timely notification of other users when time is being given up, and easier way to re-work plans in near term with late changes.

L. Rhoads, SSMO – SCRs are used as notifications of changes to the schedule. Will alerts be available in new system?

M. Johnston, S3 CDE - System will be alert to open available times and it is possible to send alert to projects that are within view of available time.

## **Topic 2: Schedule Request: Priority, Flexibilities and Constraints**

### Questions on Schedule Priorities, Flexibilities and Constraints

- Should we modify the current scheduling priorities or are they fair to the diverse mission needs?
- Priorities are not enforced by S3 or the process today, they are for information in the negotiation process. Should they be enforced?
- Missions need to define flexibilities and constraints associated with a schedule request
- Policy on flexibilities
- What is it based on? Minimum to full mission success criteria?
- When should it be applicable in the process?
- Who should be able to know it?
- What is the role of the scheduler in the negotiation process?
- What is the role of the mission ops manager, navigator, project manager?
- Should we modify the current escalation process?
- How do we coordinate across different missions and balance the different operational paradigms of our missions?
- Should missions be required to explain their requests to other missions?
- Under what conditions should a mission give up a track?

### Discussion:

Operational margins for TTC services. Each mission should have schedule margins that are able to be flexible. Each project can use this margin to negotiate, and it allows them to be more flexible and manage their requirements. There are no easy solutions to resolving conflicts, but there was consensus that the process must be based on the schedule requests and decisions must remain with the mission users.

Some missions have flexibilities and margins that they can give up during negotiation. Sometimes it is difficult to be flexible, but In requesting a mission to use their margin and release their time, a reason needs to be justified by the requester, this is one way to resolve the time gaps. Missions will release their tracks if the reason is justified by the requester, this needs to be better defined in the process and tools.

Important to make the process and tools easier for all missions to be more flexible, this is a difficult issue to resolve. New features are needed, such as alerts to inform all

schedulers that there is time available after missions give up their time if they no longer require it.

Some missions work or plan their schedules six months ahead and some plan only one month ahead, but if there's enough time ahead to plan, some missions can give up their times depending on their priorities of events. The S3 tool has the ability for each mission to lock or unlock their tracks and to set priorities for requests.

### **Schedule Request Priorities**

**Current definition is DSN process was established several years ago with NASA Science Prioritization Board. Priorities are set for each track, according to the following definitions:**

*Note: Phase is not a factor in prioritization. Missions that are in extended phase does not mean that they have lower priority than missions that are in prime mission.*

**-- Station Failure in real-time (scheduled tracks are cancelled)**

- 1. Spacecraft emergency, Determined in real time**
- 2. Mandatory for achievement of primary objectives. Support essential to spacecraft survival, Uplink to reset critical systems, launch, planetary orbit insertion**
- 3. Major, unique scientific event, Time critical. Planetary encounter, major unforeseen scientific event**
- 4. Minimum DSS maintenance. Minimum support to maintain science validity, Critical maintenance, short spans of data acquisition to assure data continuity**
- 5. Mandatory for achievement of primary objectives, Not time-critical. Certain TCMs\*, included spacecraft health and condition monitoring, planet astronomy**
- 6. Time-critical events not essential to primary mission objectives. Includes radio astronomy**
- 7. Repeated scientific opportunities, Not time critical. Improvement upon minimum science return, includes host country radio sciences**

*\*Trajectory Correction Maneuvers (TCMs) fall into two categories:*

- (1) TCMs that are constrained to a particular time may be considered Priority 2, e.g., Injection into planetary orbit*
- (2) TCMs that offer more flexibility in planning are considered Priority 5. In this instance, projects are expected to make every effort to avoid conflicts by coordinating their plans*

Some Individual responses:

S. Malhotra, SPS/S3 SSE – Schedule request priorities need more granularity, for example: tool will need to handle various levels of station failures.

M. Johnston, S3 CDE – Priorities are being used in S3 tool, but only to help find optimal solution alternatives. It is not enforced in negotiating conflict resolution, but it is visible in the display and could be used by the mission users involved in negotiation. The S3

tool not 'enforcing' it means that it allows lower priority requests to be in conflict with higher priority requests.

D. Seal, Cassini – if priority is not being used in a meaningful way, then projects will waste effort to fill in priority field. It should either mean something or not be used.

R. Burns, GSFC SSMO – MOCs are not always staffed 24/7. Will S3 allow for that restriction? (YES)

B. Arroyo, MRSS – The current negotiation process and tools do not use the above priority list.

K. Yetter, MRSS – Schedule priorities are okay to reference but users need to focus on requirements/flexibilities.

R. Burns – Priority list should be simplified, it should avoid such an event driven approach.

S. Kurtik, DSN MSM – Made an offer to missions to take a stab at improvements in the current priority list

### **Flexibilities:**

K. Yetter, MRSS – Missions shouldn't put in flexibilities that go below minimum mission success criteria.

D. Balke, Chandra – Will there be constraints allowed on flexibilities? M. Johnston – No, since it is not used often enough.

G. Lemieux, ARTEMIS – Is there a way to track flexibilities to see when they are used, to possibly regain the time if it becomes available? M. Johnston – A report can be generated to track flexibilities.

A. Kniepkamp, SSMO – What if we try to schedule everyone at minimum requirements? This will identify the extreme/hard conflicts.

L. Rhoades, SSMO – putting in your flexibilities for all your missions is a lot of work.

### **Schedule Locking – unresolved conflict resolution**

Schedule process has to accommodate where the trades can be made to resolve conflicts. There's an escalation process that every project scheduler can go through, from schedulers to MIM/Mission Managers, to make the decisions that are needed to resolve conflicts. There is a document in place for this process.

### **Topic 3: SPS S3 Overview**

#### **Slide 22 – Phases of the Schedule Process and Database**

B. Arroyo, MRSS – For an engineering example, would like to see the capability for S3 to auto generate a new schedule with each new request, be used during all phases of the scheduling process (not just at the long range phase). Process would never become "user-driven" with proposals under the control/responsibility of mission users.

S. Kurtik, DSN MSM – Current plan is that schedules will be auto-generated only for schedule requests in the long-term phase (~6 months out), and that the schedule process becomes user driven at about 6 months in. This avoids the schedule being re-generated without user control as the midrange phase begins. Users can auto generate

in local workspace at any time to generate proposals to other missions, but S3 will not automatically generate once the negotiation process has started in user driven phase.

### **Lunch break**

**Topic 4: Overview of S3 Delivery Plans and Schedule (see retreat slides)**

**Topic 5: Discussion of S3 Deployment Option (see retreat slides)**

**Topic 6: Schedule File Output Changes with SPS/S3 D1.3 Delivery (see retreat slides)**  
**Modification of OPS-6-12 Schedule File Output Format (Rev F)**

Reviewed background and reasons for file output changes

SSS will be based on a service-based approach, i.e., user will provide requests on basis of services required. Users will not be asked to specify required equipment for the service (i.e. "DSN configuration codes" will no longer be used to assign equipment, that will be done by SPS/S3 software).

OPS-6-12 Rev F was emailed out to all for review prior to retreat.

Users can get their own custom file format generated via use of style sheets for XML or via custom report tool for ASCII text format.

Overview of OPS-6-12 schedule file output

In January-February, DSN MSM plans to have Schedule /S3 transition working groups with missions to review OPS-6-12 Rev F format and contents.

Rev F Scheduling format will change in Jan 2011 (SPS/S3 v2.0 delivery)

Discussion

Q: Without DSN config codes, can SSS handle requesting additional bands, special equipment, etc? Shan: Yes

Discussion on service aliases and how they work. Shan: there needs to be more detailed discussion on this with the missions as part of the transition working group meetings.

Additional changes to 0211-Service Management (NSOE/DKF formats) are planned with SPS D1.3 delivery. We will need to work this in more detail with the projects. The MGSS Sequence software changes to accommodate 0211-ServMgmt will not be available until 2016. The SPS/S3 will be backward compatible with existing NSOE/DKF formats.

*Closing comments:*

Q: How will results of retreat be followed up on to capture the process changes?

S. Kurtik: There are plans to produce a Schedule Process document to capture process changes as we move forward. This is planned after a permanent Schedule Process Owner is appointed (early 2010).

*Tour of Deep Space Operations Center (DSOC) – Bldg 230/SFOF*